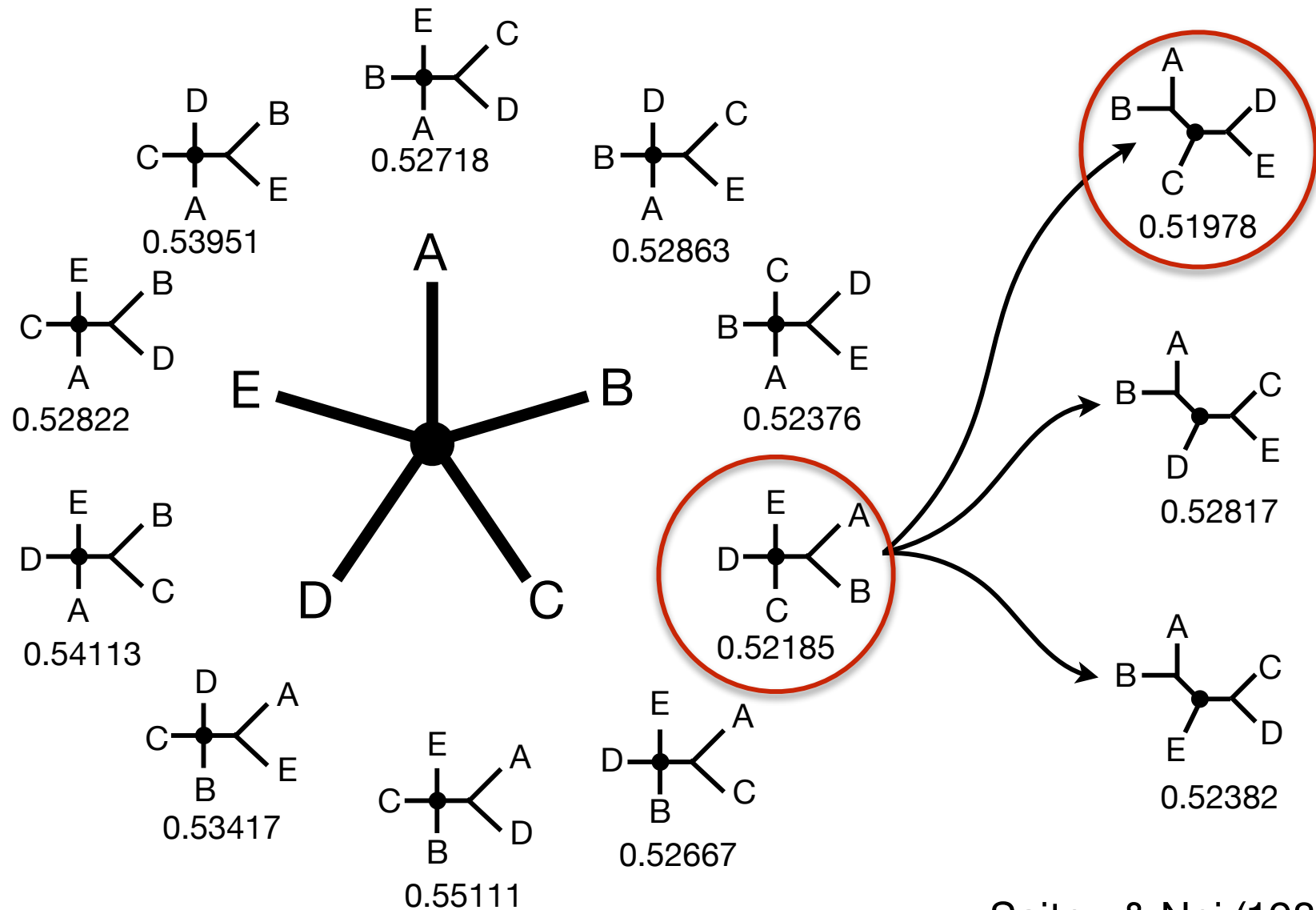
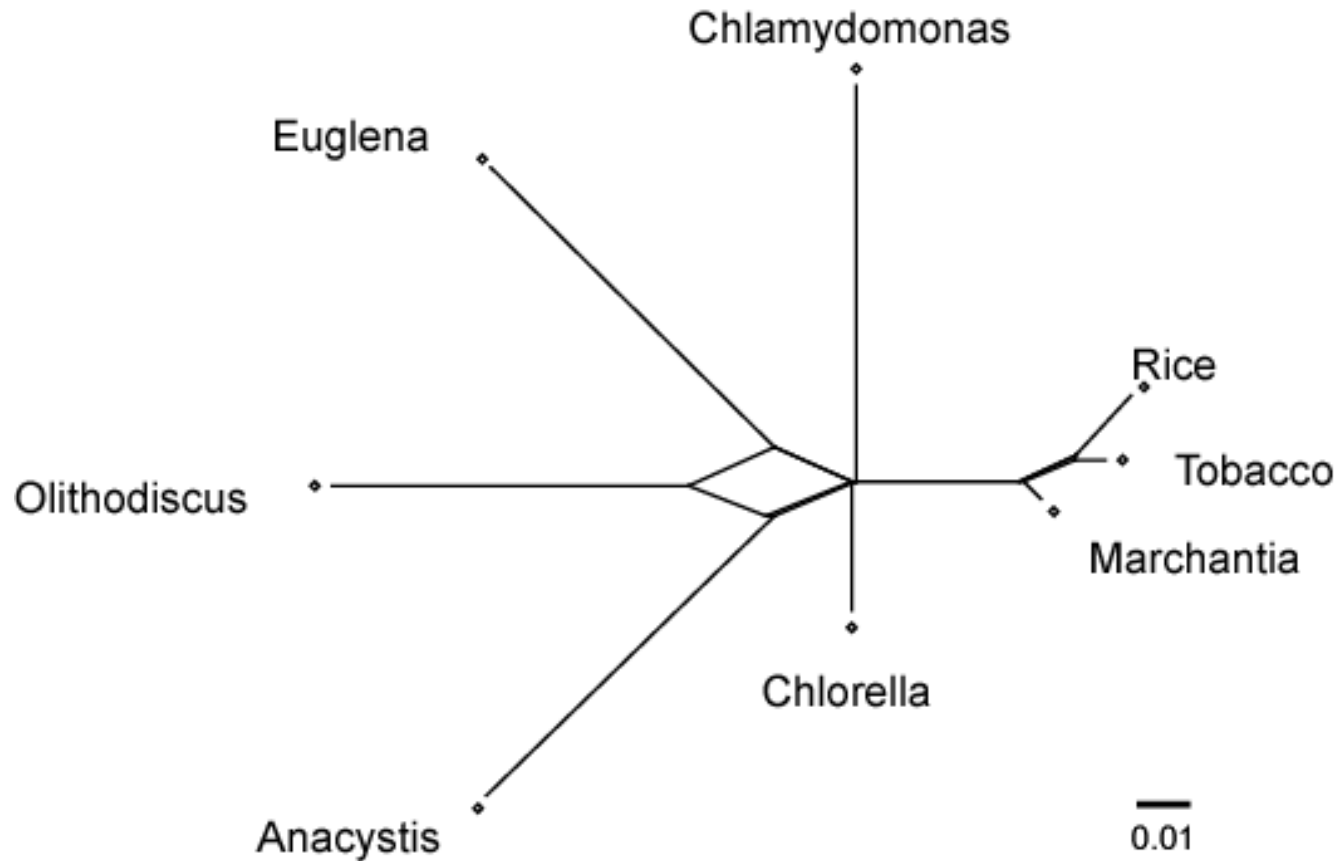


Neighbor Joining



Saitou & Nei (1987)
Studier & Keppler (1988)

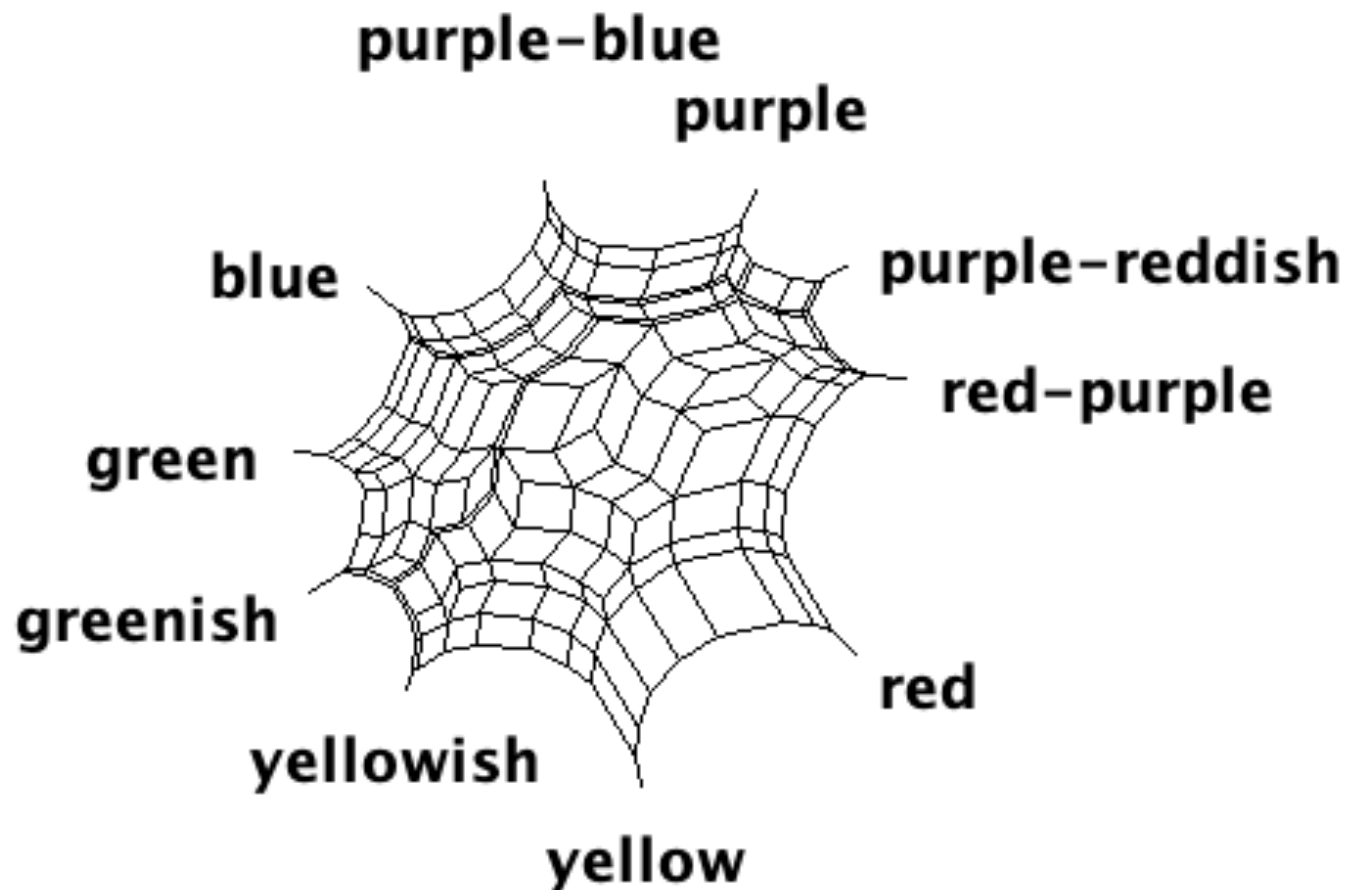
Split Decomposition



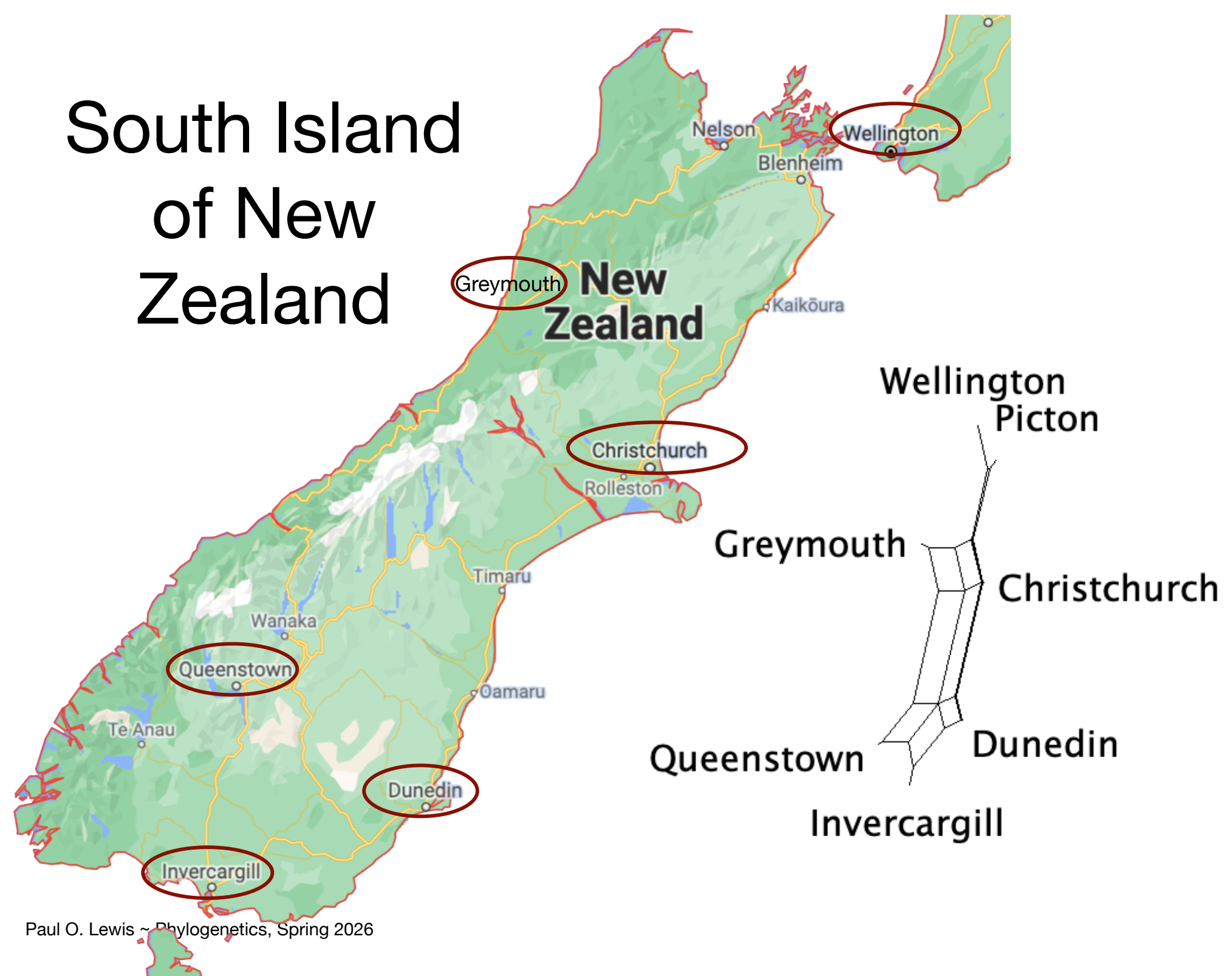
Produced by SplitsTree 4: <https://tinyurl.com/4mwhcb49>

Bandelt & Dress (1992)
Huson & Bryant (2006)

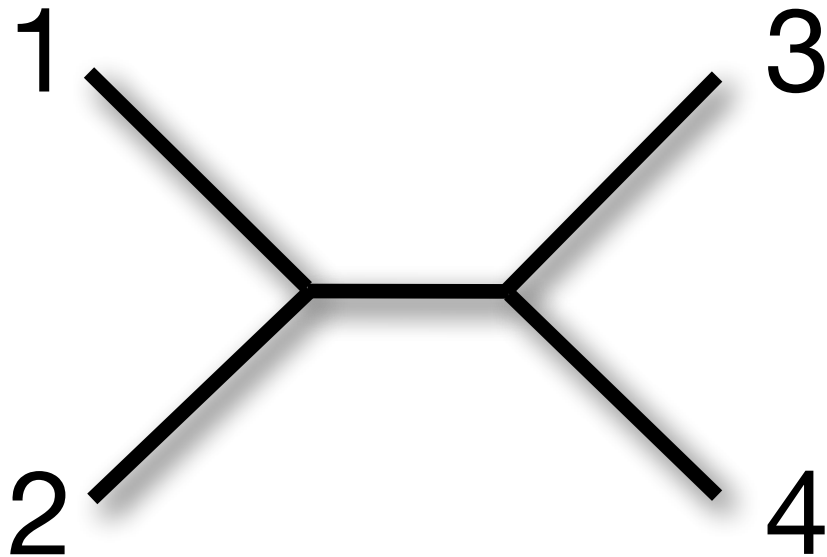
What if data are not phylogenetic?



South Island of New Zealand



Additivity and the 4-point condition



Question: On the tree at left, which of these three sums should be the smallest?

- 1) $d_{12} + d_{34}$
- 2) $d_{13} + d_{24}$
- 3) $d_{14} + d_{23}$

Split Decomposition

Pairwise distances estimated from real data

	1	2	3
2	0.13531		
3	0.11771	0.15842	
4	0.13751	0.13531	0.13091

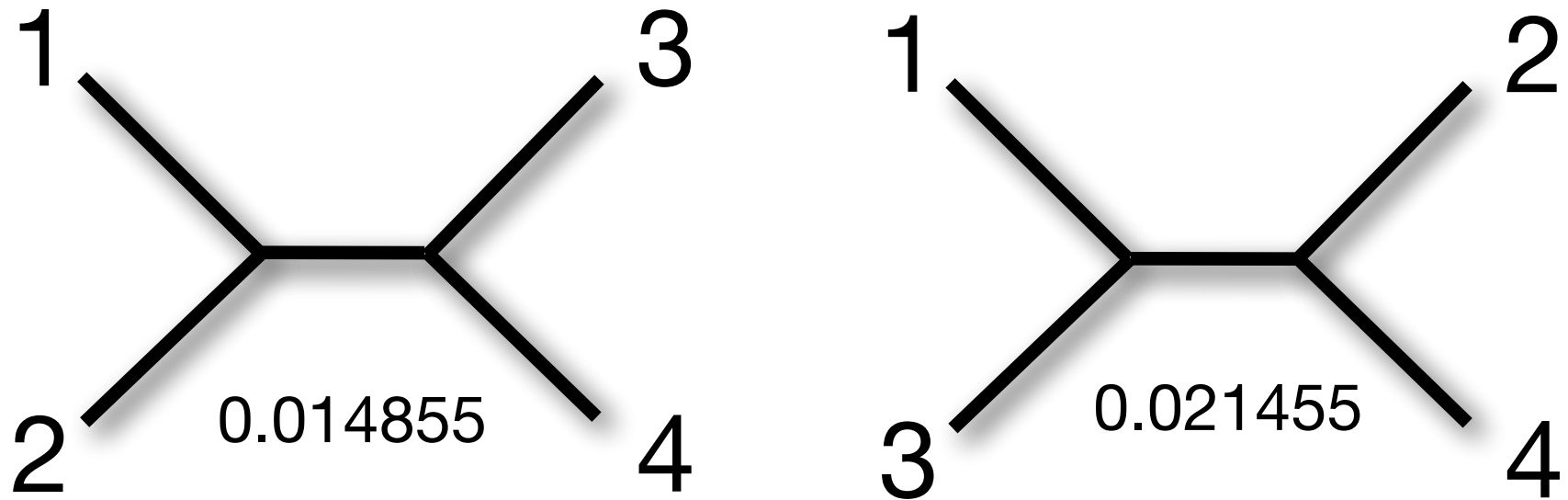
$$d_{12} + d_{34} = 0.26622$$

$$d_{13} + d_{24} = 0.25302$$

$$d_{14} + d_{23} = 0.29593 \text{ (reject)}$$

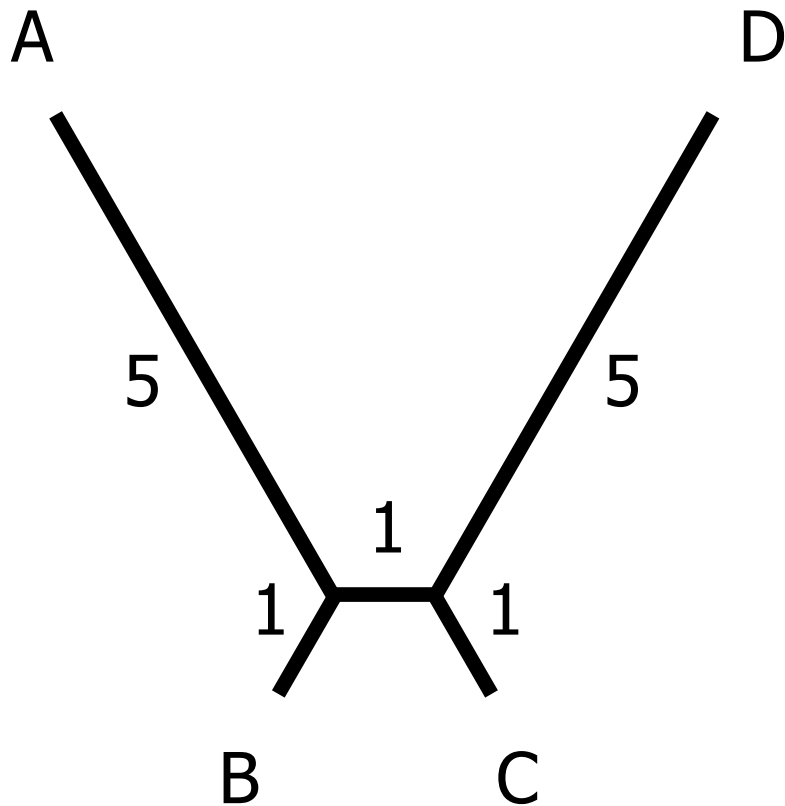
Split Decomposition

Estimate central edge for both remaining splits

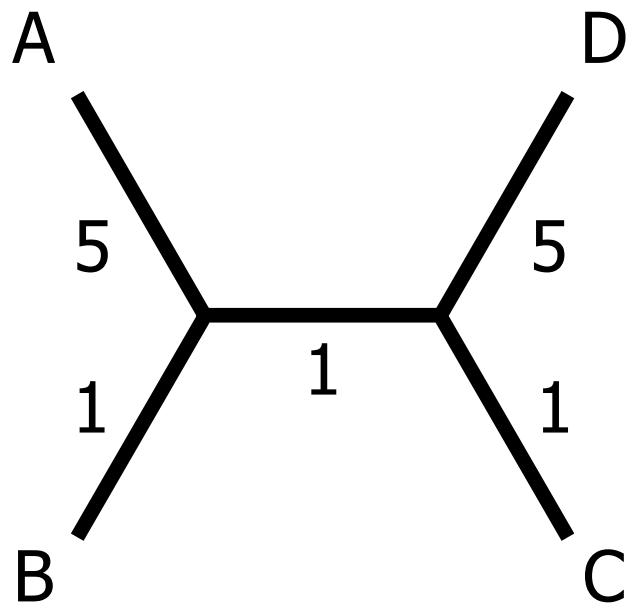


Can make one "SplitsTree" that shows both splits simultaneously

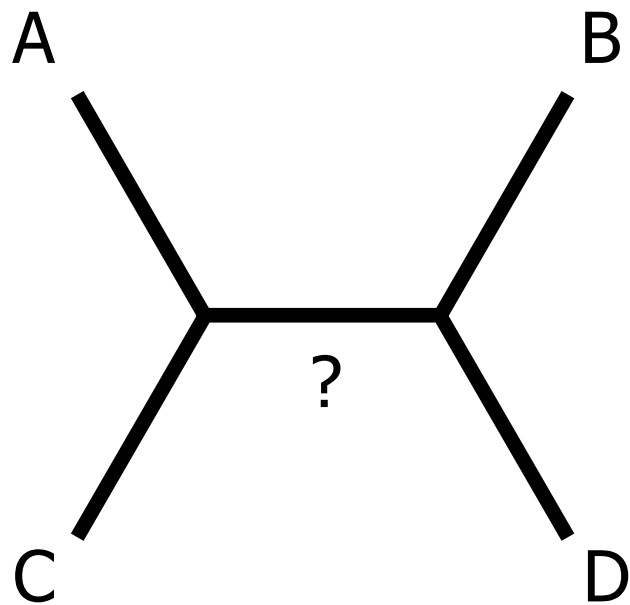
Estimating edge lengths using LS (4-taxon case)



	A	B	C
B	6		
C	7	3	
D	11	7	6

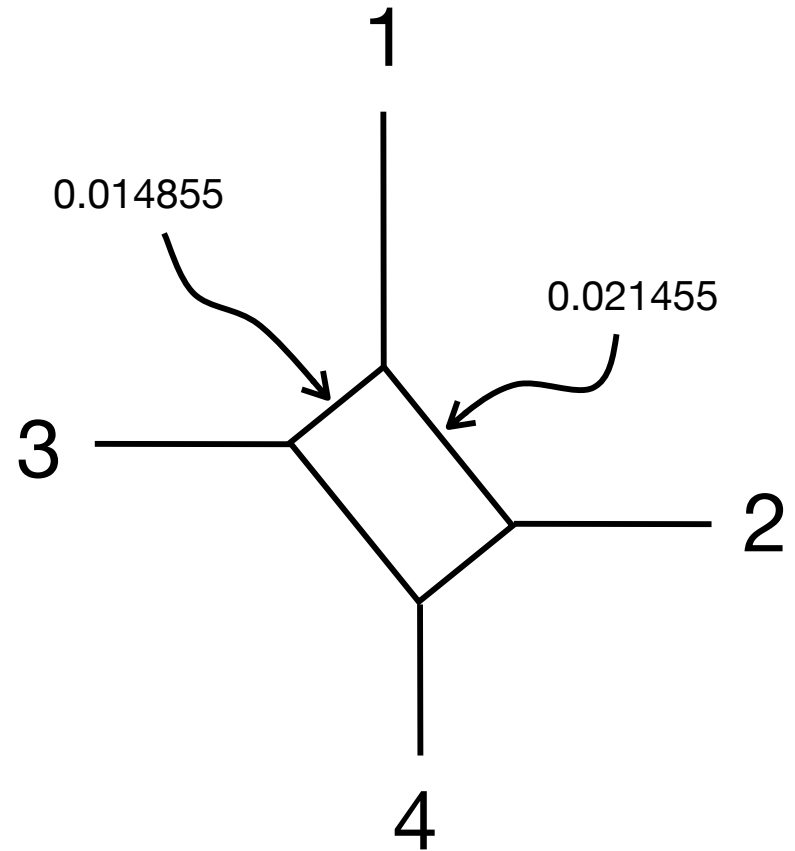
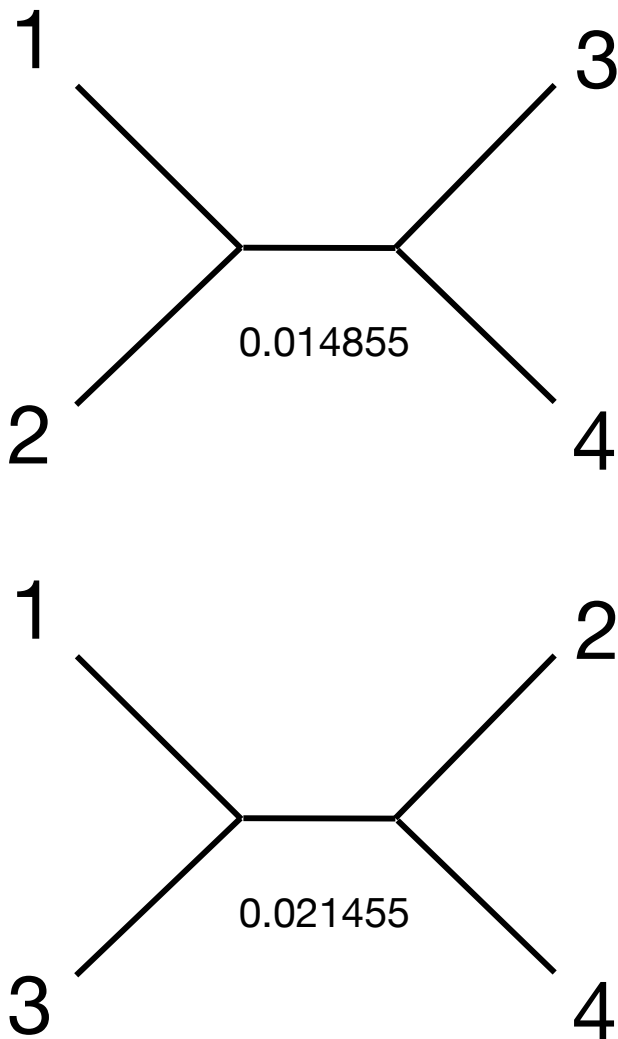


	A	B	C	D
A	0	6	7	11
B	6	0	3	7
C	7	3	0	6
D	11	7	6	0



	A	B	C	D
A	0	6	7	11
B	6	0	3	7
C	7	3	0	6
D	11	7	6	0

Split Decomposition



Estimation of external edges
similar to method described
for central edge.